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34. (NEW) The assembly of claim 24, the PCB comprising a plurality of device mounting areas for attaching heat producing devices, the cooling channel having a portion in a vicinity of each mounting area.

### REMARKS

Claim 12 has been amended. Claims 24-34 have been added. Thus, Claims 12-34 are pending in this application.

#### I. Claim Rejection under 35 U.S.C. §102

The Examiner rejected claims 12, 13, 15, 16, 17, 18, 21, and 23 under 35 U.S.C. §102(b) as being anticipated by Crawford et al. The Examiner stated that Crawford teaches an assembly having all the limitations of the above mentioned claims. Applicants amended independent claim 12. Therefore, Applicants respectfully disagree because the present independent claim now includes limitations that are neither disclosed nor suggested in Crawford.

According to the amended independent claim 12, the thermal management system comprises a coolant circulation channel loop. This loop is disclosed in the original submitted specification on page 9, line 7 – 10 and in Figs. 3, 4, and 6. Therefore, no new matter has been introduced.

Crawford does not disclose a circulation loop. On the contrary, Crawford discloses a closed chamber as a heat pipe having two ends. See column 4, line 58 – column 5, line 3. A capillary force is used to transport the liquid within the pipe. See column 5, lines 3-6. Thus, Crawford teaches a different principle of cooling with a thermal management system.

#### II. Claim Objections

The Examiner objected to claims 14, 19-20, and 22 as being dependent on a rejected independent claim, but would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claim. Applicant submits new independent claim 24 which includes all the limitations of former claims 12 and 14. All following claims 25-34 are dependent on new claim 24. Therefore, these claims are allowable at least to the extent of independent claim 24.

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SUMMARY

In light of the above remarks, reconsideration and withdrawal of the outstanding rejection is respectfully requested. It is further submitted that the application is now in condition for allowance and early notice of the same is earnestly solicited. Should the Examiner have any questions, comments or suggestions in furtherance of the prosecution of this application, the Examiner is invited to contact the agent of record by telephone or facsimile.

Applicants do not believe that any other fees are due at this time; however, should any fees under 37 C.F.R. §§ 1.16 to 1.21 be required for any reason relating to this document, the Commissioner is authorized to deduct the fees from Deposit Account No. 02-0383, (formerly *Baker & Botts, L.L.P.*) Order Number 068736.0111.

Respectfully submitted,

BAKER BOTTS L.L.P. (023640)

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By: 

Bruce W. Slayden II

One Shell Plaza

910 Louisiana Street

Houston, Texas 77002-4995

Telephone: 713.229.1786 (512) 322 2606

Facsimile: 713.229.7886

ATTORNEYS FOR APPLICANTS

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**AMENDMENT VERSION WITH MARKINGS  
TO SHOW CHANGES MADE TO THE PENDING CLAIMS**

Please amend the claims as follows:

We claim:

12. (TWICE AMENDED) An assembly comprising:  
a heat-generating device attached to a printed circuit board (PCB), and a thermal management system, the thermal management system comprising a heat sink having an interior lumen, and a coolant circulation channel loop, wherein one part of the loop is [at least partially] formed in a layer of the PCB, and the coolant circulation channel loop being in fluid communication with the heat sink lumen.

Please add the following claims:

24. (NEW) An assembly comprising:  
a heat-generating device attached to a printed circuit board (PCB), and a thermal management system, the thermal management system comprising a heat sink having an interior lumen, a coolant circulation channel at least partially formed in a layer of the PCB, the coolant circulation channel being in fluid communication with the heat sink lumen, and a pump arranged for circulating a coolant through the channel.
25. (NEW) The assembly of claim 24, further comprising a heat sink, the channel including a portion in thermal contact with the heat sink.
26. (NEW) The assembly of claim 24, wherein the PCB is a multi-layer PCB, and wherein a portion of the channel is formed by removal of portions of one or more layers of the PCB.
27. (NEW) The assembly of claim 24, wherein the PCB is a multi-layer PCB, and wherein a portion of the channel is formed by coinciding vias located in adjacent layers of the PCB.

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28. (NEW) The assembly of claim 24, wherein the channel carries a gas coolant.
29. (NEW) The assembly of claim 24, wherein the channel carries a liquid coolant.
30. (NEW) The assembly of claim 24, wherein a portion of the channel is formed by a surface of the device, so as to provide direct contact between the device and a coolant carried in the channel.
31. (NEW) The assembly of claim 24, wherein the device comprises a transistor die attached to a mounting flange, the mounting flange attached to the PCB mounting area and comprising the surface forming the respective portion of the channel.
32. (NEW) The assembly of claim 24, wherein the device comprises a transistor die attached to the PCB mounting area.
33. (NEW) The assembly of claim 24, wherein the device comprises a transistor die attached to the PCB mounting area, the transistor die comprising the surface forming the respective portion of the channel.
34. (NEW) The assembly of claim 24, the PCB comprising a plurality of device mounting areas for attaching heat producing devices, the cooling channel having a portion in a vicinity of each mounting area.

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